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Document Name: SAE J964: Test Procedure for Determining Reflectivity of Rear View Mirrors

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TEST PROCEDURE FOR DETERMINING REFLECTIVITY OF REAR VIEW MIRRORS— SAE J964 OCT84

SAE Standard

Report of the Body Engineering Committee, approved June 1966, reaffirmed without change October 1984.

1. Scope—This test procedure is intended for use in measuring the reflectance of rear view mirrors.

2. Apparatus

2.1 The apparatus shall consist of a light source, a sample holder, a receiver unit with a photodetector and an indicating meter (Fig. 1), and means for negating the effects of extraneous light. The receiver may incorporate a light-integrating sphere to facilitate measuring reflectance of nonflat (convex) mirrors (Fig. 2).

2.2 Spectral Characteristic of Light Source and Receiver—The light source shall consist of an incandescent tungsten filament lamp operating at a nominal color temperature of 2856 K (CIE Illuminant A), and associated optics to provide a near collimated light beam. A voltage stabilizer is recommended for maintaining a fixed lamp voltage during instrument operation. The receiver shall have a photodetector with a spectral response proportional to the photopic luminosity function of the standard CIE observer. Any other combination of illuminant-filters-receptor

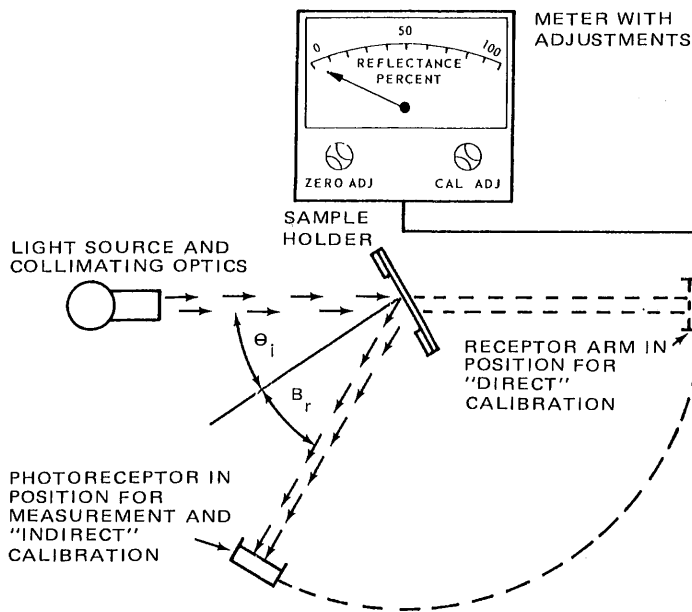


FIG. 1—GENERALIZED REFLECTOMETER SHOWING GEOMETRIES FOR THE TWO CALIBRATION METHODS

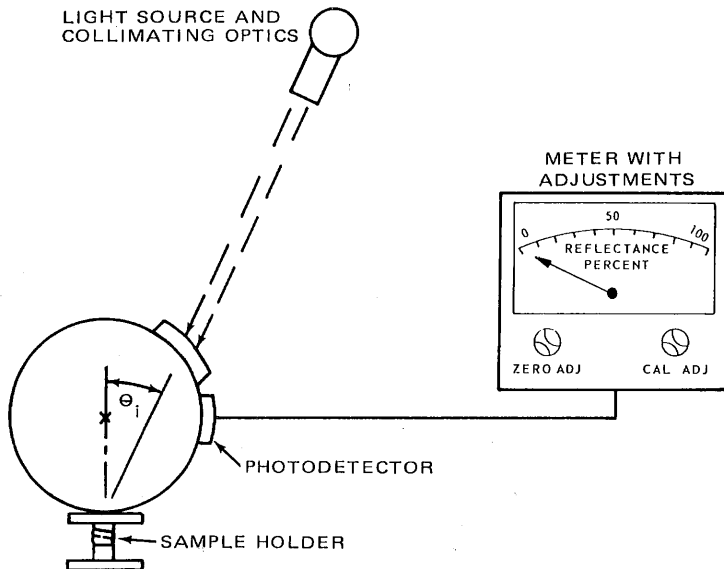


FIG. 2—GENERALIZED REFLECTOMETER, INCORPORATING AN INTEGRATING SPHERE IN RECEIVER

which gives the overall equivalent of Illuminant A and average visual response may be used. When an integrating sphere is used in the receiver, the interior surface of the sphere shall be coated with a matt (diffusive), spectrally nonselective white coating.

2.3 Geometric Conditions—The angle of the incident beam (θ_i) shall preferably be 0.44 ± 0.09 rad (25 ± 5 deg) and shall not exceed 0.53 rad (30 deg) from the perpendicular to the test surface, and the axis of the receptor shall make an angle (θ_r) with this perpendicular equal to that of the incident beam (Fig. 1). The incident beam upon arrival to the test surface, shall have a diameter of not less than 19 mm (0.75 in). The reflected beam shall not be larger than the sensitive area of the photodetector, shall not cover less than 50% of such area, and as nearly as possible shall cover the same area segment used during instrument calibration.

When an integrating sphere is used in the receiver section, the sphere shall have a minimum diameter of 127 mm (5 in). The sample and incident beam apertures in the sphere wall shall be of such a size as to admit the entire incident and reflected light beams. The photodetector shall be so located as not to receive direct light from either the incident or the reflected beams.

2.4 Electrical Characteristics of the Photodetector-Indicator Unit—The photodetector output as read on the indicating meter, shall be a linear function of the light intensity on the photosensitive area. Means (electrical and/or optical) shall be provided to facilitate zeroing and calibration adjustments. Such means shall not affect the linearity or the spectral characteristics of the instrument. The accuracy of the receptor-indicator unit shall be within $\pm 2\%$ of full-scale, or $\pm 10\%$ of the magnitude of the reading, whichever is smaller.

2.5 Sample Holder—The mechanism shall be capable of locating the test sample such that the axes of the source arm and receptor arm intersect at the reflecting surface. The reflecting surface may lie within or at either face of the mirror sample, depending upon whether it is a first-surface, second-surface, or prismatic "flip" type mirror.

3. Procedure

3.1 Direct Calibration Method—In the direct calibration method, air is used as the reference standard. This method is for those instruments which are so constructed as to permit calibration at the 100% point by swinging the receiver to a position directly on the axis of the light source (Fig. 1).

It may be desired in some cases (such as when measuring low reflective surfaces) to use an intermediate calibration point (between 0 and 100% on the scale) with this method. In such a case, a neutral density filter of known transmittance may be inserted in the optical path, and the calibrate control will then be adjusted until the meter reads the percent transmission of the neutral density filter. This filter must be removed before making reflectivity measurements.

3.2 Indirect Calibration Method—The indirect calibration method is for those instruments with fixed source and receiver geometry. A properly calibrated and maintained reflectance standard is required. This reference standard should preferably be a flat mirror with a reflectance value as near as possible to that of the test samples.

3.3 Flat Mirrors Measurement—The reflectance of flat mirror samples is measured on instruments which employ either the direct or indirect calibration method. The reflectance value is read directly from the instrument indicator meter.

3.4 Nonflat (Convex) Mirror Measurement—Reflectance of nonflat (convex) mirrors measurement requires the use of instruments which incorporate an integrating sphere in the receiver unit (Fig. 2). The reflectance value is read directly from the instrument indicating meter.